characteristic fossils, the leading zonal forms—*Olenellus*, *Paradoxides*, *Olenus* and *Dictyonema*—being the only fossils noted from the Cambrian system. In dealing with Ordovician and Silurian strata the graptolite zones receive particular attention, and other zonal fossils are mentioned. The full stratigraphical details relating to these systems make one feel that scant justice is done to the Devonian; but as a matter of fact our knowledge of that system is far less precise. Here, as occasionally elsewhere, a column for Continental divisions is given. In the Lower Carboniferous, Mr. Hobson starts with the Devon succession and places the Lower Culm Measures with the Coddon Hill Beds on the horizon of the Lower Limestone Shales, whereas their characteristic *Posidonomya* and *Goniatites* indicate an horizon equivalent to the Upper Carboniferous Limestone or Yoredale Series. He has not, however, ventured to indicate zones in the Carboniferous, although materials have been gathered in the neighbourhood of Bristol as well as in northern counties, to which reference is made in the preface. Here and there we would suggest a greater uniformity in method: for instance, the Ammonite zones of the Lias are noted under the names *Ægoceras*, &c.; those of the Inferior Oolite are noted as *Parkinsoni* zone, &c.; and those of the Cretaceous rocks as *Ammonites lautus*, &c. The most difficult correlation is, doubtless, that of the Pleistocene, and here the student may well pause, for the "Upper Boulder Clay" of different areas is not to be regarded as contemporaneous. Indeed, the compiler in his preface remarks that "strata named on corresponding horizontal lines cannot, in some cases, be considered to be of corresponding age"; and the student will do well to bear this in mind.

The work is issued as one of the museum handbooks of the Manchester Museum, Owens College. It cannot fail to be of great service for reference to geologists in general. It bears evidence of the most painstaking care and of wide research up to the date of publication; and we feel confident that the labour will be appreciated.

*Die Partiellen Differential-gleichungen der mathematischen Physik.* By Heinrich Weber, based on Riemann's lectures. Vol. ii. Pp. 527. (Brunswick: Fried. Vieweg and Son, 1901.)

IN reviewing the first volume of this book (NATURE, vol. lxiii. p. 390) it was pointed out that owing to the great advances in mathematical physics which have taken place in the forty years since Riemann's time, Prof. Weber had found it necessary, instead of merely issuing a revised edition of the well-known "Partielle Differentialgleichungen," to write practically an entirely new book. The present volume, which is written much on the same general lines as the first, is divided into five parts. The first contains the more important properties of hypergeometric series and their application to the theory of linear differential equations. The second part, dealing with conduction of heat, is much after the lines of Riemann's original treatment, and treats mainly of conduction in one dimension and conduction in a sphere. The third part is devoted to theory of elasticity and vibrations, the torsion problem being included in the former subject, and vibrations of strings and membranes in the latter. Electrical oscillations come next in order, and the last part consists of hydrodynamics and propagation of plane and spherical sound-waves, including Riemann's own theory of sound-waves of finite amplitude.

Seeing that a whole volume might be written on any one of these branches of mathematical physics and still leave many interesting points untouched, the treatment in the present book is necessarily but fragmentary in character, but Prof. Weber is to be congratulated on the number of points which he has been able to touch in the limited space of about 500 pages. At the end is an index to both volumes. G. H. B.

## LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

### The Total Solar Eclipse of September 9, 1904.

As inquiries have already been addressed to me as to the practicability of observing this eclipse, which passes across the Pacific Ocean (see "Nautical Almanac," 1904, pp. 487–490), perhaps I may be allowed, thus early, to communicate, through your instrumentality, the information I have collected on the subject.

The Walker Islands, which appear on some maps of the locality in the position 149° W., 4° N., would have been, if they existed, very favourably situated for the observation of the eclipse. But recent surveys have shown conclusively that they do not exist.

Kingman, or Caldew, Reef, 162° W., 6° N., is also favourably situated, but is stated in the Admiralty Sailing Directions to be partially dry at low water only.

Palmyra Island is placed by the most recent survey in the position 162° 6′ W., 5° 52′ N., and is thus a little too far south to be available. Proceeding westwards, the next group of islands encountered is the Marshall Islands. But even the most easterly of the group on the track of the eclipse—Aur—is too far west for our purpose, as the middle of the eclipse occurs there shortly after sunrise.

It appears that there is no island conveniently placed for the observation of this eclipse, and astronomers must wait for the total eclipse of the following August, which will afford ample opportunity for observation in Canada, Spain and North Africa.

A. M. W. DOWNING.

### The Dilution of Acetylene for Heating Purposes.

YOU have been good enough on one or two previous occasions to give me a few lines in your columns on questions connected with acetylene for heating, and as this use of the gas is extending and will undoubtedly have a much wider extension in the near future, perhaps you will renew your courtesy in this matter.

In country places for domestic and laboratory purposes, more especially with the advance of electricity and decline of coal gas for lighting, the field for acetylene for heating is very large and has so far met with strangely little consideration. The combustion of a gas containing 92 per cent. of carbon successfully in a Bunsen burner is not more easy than its combustion to produce a trustworthy luminous flame. The chief difficulty from which we suffer in the former matter is the relatively high pressure under which the gas must be burnt. No one has yet devised a Bunsen burner which will give a flame large enough for ordinary working purposes under a pressure of less than six inches of water, and even then luminosity is not entirely banished, practically no margin being left for incorrect adjustment of the burner. The pressure is objectionable, it puts the gas fittings to a severe test in the matter of leakage, it is much more than is required for lighting and has to be specially arranged for in many generators, and in those of the automatic class it involves more "after gas," necessitating larger storage capacity. The fine orifice of the jet and the necessarily narrow tube with its accompanying increased internal friction and the large injecting power essential, all make high pressure a necessity. That this luminosity trouble is partly a matter of temperature can be easily shown by heating the tube of a non-luminous Bunsen, or pouring water on to the tube of one showing luminosity, the effect being very striking, and some improvements on these lines have suggested themselves and are efficient as far as they go. We want, however, to attack the root of the matter and dilute our acetylene to begin with, and this dilution would not be altogether objectionable from a lighting point of view. Lighting burners at present generally inject some air and can only themselves be regarded as on the verge of respectability; quite an absurdly small amount of benzene vapour is sufficient to put out of temper the lighting burners now on the market. Such dilution would give them the margin for bad usage which makes so much for success in practice, even though wasteful in theory.

In seeking a diluent, one turns naturally first to metallic carbides other than calcium, with the idea of finding a commercially possible carbide which will give methane or hydrogen on decomposition with water and could be blended with calcium carbide by the manufacturer to suit, if necessary, various requirements, when we should once more see the early attempts to use for lighting the ordinary household Bray burner repeated with success. Manganese carbide is stated to be easily formed, and by Moissan to be decomposed by water yielding equal volumes of methane and hydrogen, hausmanite (presumably prepared by heating pyrolusite) being recommended. An attempt on my part to make a few grams, though it is true that the amperes at disposal only just reached double figures, failed as regards any gas produced, although reduction undoubtedly took place. I should not presume to quote so insignificant an experiment had not the manager of the Acetylene Illuminating Co., who courteously gave me an interview some months ago, told me that the Company's experiments on this carbide (and science is indebted to the Company for a great many researches, which I hope it may see fit to publish) had not led to the production of a carbide at all easily decomposed by water. I suggested the use of manganese mud as being easily obtainable, very free from silica as compared with pyrolusite, not so highly oxidised, and in a very fine state of division, and I hope that the Company may see fit to try it. Among other carbides, that of aluminium seems to offer attractions for commercial investigation, and although magnesium carbide cannot be prepared in the electric furnace alone, I do not think that dolomite as a substitute for pure carbonate of lime has been experimented upon.

Failing a suitable carbide for dilution, will not some organic chemist come forward with a bye- or waste product which will decompose in the presence of hot caustic lime produced in the generator, with, if not the production of methane, hydrogen or carbon monoxide, at least some indifferent gas, such as nitrogen or carbon dioxide?

Investigations are wanted as to the amount of diluent required to banish luminosity under some standard conditions. I can only speak at present of carbon dioxide; a Bunsen burner consuming one cubic foot of acetylene per hour under six inches water pressure, showing a fully developed luminous zone rather greater in diameter than the sum of the widths of the non-luminous zone on either side, requires a supply of carbon dioxide at the rate of 0·15 cubic feet per hour to destroy completely this luminosity. A. E. MUNBY.

Felsted, November 1.

### Magnetic Iron Ore as a Material for Concrete Blocks.

THE account of harbour works in NATURE of October 24 (p. 639) causes me once more to draw attention to the great advantage which would be gained by the use of magnetic iron ore as a material for concrete blocks. If magnetite is used instead of ordinary rock in the shape of fragments, and magnetic sand or ilmenite sand instead of common sea sand, concrete blocks can be obtained which have all the strength of the ordinary concrete blocks and which weigh, when immersed in water, exactly twice as much as the ordinary blocks. Such an increase in weight makes the magnetic blocks far superior as regards resistance to the waves. Work constructed with magnetic blocks will stand when other work will be destroyed. This superior effect of magnetic blocks is quite independent of the size of the blocks. The artificial increase of the size of ordinary concrete blocks is mentioned as a means of increasing the power of resistance, but there are certain to be some objections to this method, and if the great masses are ruptured after the rusting away of the cases, portions may give way. It is therefore better and more convenient to use the superior composition. As regards the expense, it may be mentioned that to obtain a good effect it is only necessary to use magnetic blocks for the most exposed spots of a dam, and more in the nature of a surface coating. There are immense natural deposits of magnetite, also of titanium ore, which latter is not of value for steel making, and it would surely be possible to obtain the necessary quantities in Scandinavia, or if for harbours in the East, then there would be inexhaustible supplies in southern India not too far from the coast. It has been argued that the iron ore would decay on exposure to sea water and that it would injure the cement. This may be true for inferior iron ores, but not for rich, pure magnetite and ilmenite, as I have proved by direct experiments. I have exposed fragments of magnetite to the action of filtered sea water in clean glass jars where every trace of decomposition would have been detected, but though I continued the test for a year the specimens stood the test very well. Moreover, I made sample blocks with Portland cement and subjected them to crushing tests, which showed them to be perfectly satisfactory as regards strength.

H. WARTH.

### The San Clemente Island Goat.

LAST summer, at San Pedro, California, I was shown a goat which had just been brought over from San Clemente Island. Mr. Müller, the owner of the animal, told me that the goats of that island, running practically wild since the unknown date of their introduction, were all alike, constituting an easily recognisable race. The animal was quite reddish, about the colour of a red deer; front of face black; a pale (reddish) stripe down each side of nose, and enclosing the eye; cheeks black; chin light; ears blackish above; neck and anterior part of body strongly suffused with black. The light facial stripes were particularly distinct.

The Santa Catalina Island goats, I was informed, are variously coloured. This is doubtless due to the fact that Catalina is a popular resort, and fresh animals are frequently introduced.

T. D. A. COCKERELL.

East Las Vegas, New Mexico, U.S.A., October 27.

### Food of Grass Snakes.

MAY I say, in defence of Dr. Gerald Leighton (see p. 625), that on two occasions I have found mice inside grass snakes. The first case was on a moor near Parkstone, Dorset, where on opening a smallish snake we found a mouse only partly digested. The other case occurred here last year, when I found a small shrew in a large grass snake. Also with regard to them swallowing birds, I have three times found birds inside them. In each case they were young ones; two were probably young larks (they were both in one snake), and the other was a young robin. C. M. ROGERS.

Wellington College, Berks, October 28.

## *THE OBSERVATORY OF MONT BLANC.*[1]

IN observing the physical features of the Alpine regions, M. Vallot and the several members of his family show a devotion that no discouraging circumstances can damp, and an energy that rises superior to the inclemencies of the weather and the loneliness of the situation. His original observatory, constructed after much labour and in spite of many difficulties, was found to be in an unfortunate position, owing to the accumulation of snow with which neither labour nor expense could efficiently deal. Without hesitation this construction is abandoned, and in the light of greater experience a fresh site is selected and a new observatory built, where, from the peculiarity of configuration, snow cannot collect and interfere with the progress of the work. This building, constructed in 1898, admirably fulfils its purpose, and here, at an altitude of 4358 m., among the eternal snows, M. Vallot and his band of energetic labourers pursue their scientific avocations. These are sufficiently various, and in the present volumes we have the result of three distinct investigations, one dealing with the influence of barometric pressure on the chemical action of solar light, another on the velocity of water in streams and under glaciers, while the last gives an account of experiments undertaken with the view of detecting the rate and character of glacier motion.

Of the first of these discussions it is sufficient to say that the author aims at a re-examination of the adequacy of the formula found by Bunsen and Roscoe in similar researches, wherein occurs a numerical coefficient

[1] "Annales de l'Observatoire météorologique physique et glaciaire du Mont Blanc." Publiées sous la direction de J. Vallot, Fondateur et Directeur de l'Observatoire. Tome iv. Pp. ix + 189. Tome v. Planches du Tome iv. (Paris: G. Steinheil, Editeur, 1900.)